WE CLAIM:

1. A chelating compound of the formula:

$$R_{3}$$
 R_{3}
 R_{3}
 R_{4}
 R_{4}
 R_{3}
 R_{4}
 R_{3}
 R_{4}
 R_{4}
 R_{4}
 R_{3}
 R_{4}
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 R_{4}
 R_{4}
 R_{4}
 R_{4}
 R_{5}
 R_{7}
 R_{1}
 R_{2}
 R_{2}
 R_{4}
 R_{4}
 R_{4}
 R_{5}
 R_{7}
 R_{1}
 R_{2}
 R_{4}
 R_{4}
 R_{4}
 R_{5}
 R_{4}
 R_{5}
 R_{5}
 R_{7}
 R_{1}
 R_{1}
 R_{2}
 R_{3}
 R_{4}
 R_{5}
 R_{5}
 R_{7}
 R_{1}
 R_{1}
 R_{2}
 R_{3}
 R_{4}
 R_{4}
 R_{5}
 R_{5}
 R_{7}
 R_{1}
 R_{1}
 R_{2}
 R_{3}
 R_{4}
 R_{5}
 R_{5}
 R_{7}
 R_{1}
 R_{1}
 R_{2}
 R_{3}
 R_{4}
 R_{5}
 R_{5}
 R_{7}
 R_{1}
 R_{1}
 R_{2}
 R_{3}
 R_{4}
 R_{5}
 R_{5

2 wherein

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3 R is hydrogen or

$$R_1$$
 is hydrogen or O
 $-CH_2CR_6$

and one of R and R₁ is other than hydrogen;
R₃ is alkylene having from 1 to 8 carbons,
1,2-cycloalkylene having from 5 to 8 carbons,
or 1,2-arylene having from 6 to 10 carbons, or

R₄ is hydrogen, hydroxymethyl, alkyl having from

1 to 6 carbons or

 R_5 and R_6 are each, individually, hydroxy,

alkoxy having from 1 to 18 carbons,

hydroxy-substituted alkoxy having from 1 to 18

carbons, amino or alkylamido having from 1 to

15 18 carbons;

16		the phosphate group mono and diesters of the
17		compounds thereof with monohydric and polyhydric
18		alcohols having from 1 to 18 carbons, or alkylamino
19		alcohols, each having from 1 to 18 carbons, and
20		the salts thereof.
1	2.	A chelating compound of claim 1 wherein R is
		-ch cR ₅
2		and R ₁ is
		chelate -cH2CR6.
1	3.	A chelating compound of Claim 2 wherein R ₅ and R ₆
2		are each, individually, hydroxy, alkoxy having from 1
3		to 8 carbons, amino or alkylamido having from 1 to 8
4		carbons.
1	4.	A chelating compound of Claim 3 wherein R ₅ and R ₆
2		are hydroxy or a salt thereof.
1	5.	As a chelating compound of Claim 4,
2		N,N'-bis-(pyridoxal +5-phosphate) ethylenediamine-
3		N,N'-diacetic acid or a salt thereof.
1	6.	A chelating compound of Claim 1 wherein R ₃ is
2		alkylene having from 2 to 6 carbons.
1		A chelating compound of Claim 1 wherein R ₃ is
2		cyclohexyl. As a chelating compound of Claim 7,
1	8.	44
2		N, N'-bis-(pyridoxal-5-phosphate)-trans-1, 2-cyclohexyl-
3		diamine-N,N'-diacetic acid or a salt thereof.
A^{1}	9.	R chelate of a compound of Clarm 1, 2, 3, 4, 5, 6, 7,
2		or 8 with a metal ion having an atomic number within
3		the range of 21 to 29, 42, 44 or 58-70.

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10. A chelate of Claim 9 wherein the metal ion is
2
        selected from the group consisting of chromium(III),
        manganese(II), iron(III), iron(II), cobalt(II),
3
        nickel(II), copper(II/), praseodymium(III),
        neodymium(III), samarium(III), ytterbium(III),
5
        gadolinium(III),/texbium(III), dysprosium(III),
6
        holmium(III) and embium(III).
7
    11. A calcium salt of a chelate of Claim 9.
1
    12. A calcium salt of Claim 11 wherein the molar ratio
        of calcium to chepating compound is from 0.05 to
2
        1.0.
3
    13. A calcium salt of Claim 12 wherein the molar ratio
1
        of calcium to chelating compound is from 0.1 to 0.5.
    14 A chelate of a compound of Claim 1, 2, 3, 4, 5, 6,
        7, or 8 with a manganese(II) ion.
    15. As a chelate of Claim 14 / a manganese(II) chelate of
1
        N, N'-bis-(pyridoxal-5-phosphate) ethylenediamine-
2
        N, N'-diacetic acid or a/salt thereof.
3
    16. A calcium salt of the chelate of Claim 15.
1
    17. A calcium salt of Claim 16 wherein the molar ratio
1
        of calcium to chelating compound is from 0.05 to
2
        1.0.
3
    18. A calcium salt of Claim 17 wherein the molar ratio
1
        of calcium to chelating compound is from 0.1 to 0.5.
2
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19. As a chelate of Claim 14, a manganese(II) chelate of

diamine-N, N'-diacetic acid or a salt thereof.

N, N'-bis-(pyridoxal-5-phosphate)-trans-1, 2-cyclohexyl

1

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1 20. A chelating compound intermediate of the formula

$$R_4$$

CH

OH

CH

 $CH_2OP(OH)_2$

(VII)

- wherein
- R₃ is alkylene having from 1 to 8 carbons or cycloalkyl having from 3 to 8 carbons;
- R₄ is hydrogen, hydroxyalkyl having from 1 to 6 carbons, alkyl having from 1 to 6 carbons or

- 7 and the salts thereof.
- 1 21. A chelating compound intermediate of Claim 20
- 2 wherein R₄ is

- 1 22. A chelating compound intermediate of Claim 21
- 2 wherein R₃ is an alkylene group having from 2 to 6
- 3 carbons.
- 1 23. A chelating compound intermediate of Claim 22
- wherein R₃ is ethylene.
- 1 24. A chelating compound intermediate of Claim 21
- wherein R₃ is 1,2-cycloalkylene.
- 1 25. A chelating compound intermediate of Claim 24
- wherein R₃ is 1,2-cyclohexyl.

1 26. A chelating compound intermediate of the formula

$$R_4$$
 CH_2
 CH_2

2 wherein

3

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R₃ is alkylene having from 1 to 8 carbons or cycloalkyl having from 3 to 8 carbons;

R₄ is hydrogen, hydroxyalkyl having from 1 to 6 carbons, alkyl having from 1 to 6 carbons or

7 and the salts thereof.

27. A chelating compound intermediate of Claim 26

wherein R₄ is

and the salts thereof.

28. A chelating compound intermediate of Claim_26

wherein R₃ is an alkylene group having from 2 to 6

3 carbons.

1 29. A chelating compound intermediate of Claim 28

wherein R₃ is ethylene.

1 30. A chelating compound intermediate of Claim 26

wherein R₃ is 1,2-cycloalkylene.

31. A chelating compound intermediate of Claim 30 1 wherein R₃ is 1,2-cyclohexane. Sub A3 32. A NMRI contrast medium_composition consisting essentially of a cherate of a compound of Claim 1, 3 2, 3, 4, 5, 6, 7 ox with a metal ion having an atomic number of from 21-29, 42, 44 or 58-70 and a 4 5 pharmaceutically/acceptable, compatible excipient. 1 33. A NMRI contrast medium composition of Claim 32 wherein the metal ion is selected from the group 2 3 consisting of chromium(III), manganese(II), iron(III), iron(II), cobalt(II), nickel(II), 4 5 copper(II), praseodymium(III), neodymium(III), 6 samarium(III), ytterbium(III), gadolinium(III), terbium(III), dysprosium(III), holmium(III) and 7 8 erbium(III). 34. An NMRI contrast medium composition of Claim 33 1 containing a calcium salt of the chelate. 35. An NMRI contrast medium/composition of Claim 34 containing containing a calcium salt of the chelate wherein the molar ratio of calcium to chelating compound is from 0.05/to 1.0. 36. An NMRI contrast medium composition of Claim 35 1 2 containing a calcium salt wherein the molar ratio of 3 calcium to chelating compound is from 0.1 to 0.5. 1 37. An NMRI contrast medium composition of Claim 33 2 wherein the metal ion is manganese(II) ion. 38. An NMRI contrast medium/composition of Claim 33 1 wherein the compound is/N,N/-bis-(pyridoxal-2 3 5-phosphate) ethylenediamine-N, N'-diacetic acid, N, N'-bis-(pyridoxal-5-phosphate)-trans-1, 2-cyclohexyl 4 diamine-N,N'-diacetic acid, or a salt thereof. 5 1 39. An NMRI contrast medium composition of Claim 38

containing a calcium salt.

- 1 40. An NMRI contrast medium composition of Claim 39 2 containing a calcium salt, wherein the molar ratio of calcium to chelating compound is from 0.05 to 3 4 1.0.
- 41. An NMRI contrast medium composition of Claim 40 1 2 containing a calcium salt, wherein the molar ratio 3 of calcium to chelating/compound is from 0.1 to 0.5.
- 42. An NMRI contrast medium composition of Claim 33 1 2 wherein the concentration of chelate salt in the 3 medium is from 0.001 to 5.0 moles per liter.
- 43. An NMRI contrast medium composition of Claim 42 1 2 wherein the concentration of chelate salt in the medium is from 0.1 to/0.5 moles per liter. 546 AZ 28/6323. ALL 235 =
 - An improvement in the method of performing NMR imaging with a patient comprising administering to the patient, an effective amount of a chelate of a compound of Claim 1, 2, 3, 4, 5, 6, 7 or 8 with a metal ion having an atomic number of from 21-29, 42, 44 or 58-70/
 - 45. An improvement in the method for performing NMR 1 2 imaging of Claim 44 wherein the metal ion is 3 selected from the group consisting of chromium(III), 4 manganese(II), iron(III), iron(II), cobalt(II), nickel(II), copper(II), praseodymium(III), 5 6 neodymium(III), samarium(III), ytterbium(III), 7 gadolinium(III), texbium(III), dysprosium(III), holmium(III) and erbium(III). 8
 - 46. An improvement in the method for performing NMR 1 2 imaging of Claim 44 wherein the chelate of the 3 compound is a calcium salt.
 - 47. An improvement in the method for performing NMR 1 2 imaging of Claim 46 wherein the molar ratio of calcium to chelate is from 0.05 to 1.0. 3

- 48. An improvement in the method for performing NMR imaging of Claim 47 wherein the molar ratio of calcium to chelate is from 0.1 to 0.5.
- 49. An improvement in the method for performing NMR imaging of Claim 44 wherein the the metal ion is manganese(II) ion.
 - 50. An improvement in the method for performing NMR imaging of Claim 44 wherein the compound is N,N'-bis-(pyridoxal-5-phosphate)ethylenediamine-N,N'-diacetic acid, N,N'-bis-(pyridoxl)-5-phosphate)-trans-1,2-cyclohexyldiamine-N,N'-diacetic acid, or a salt thereof.
- 1 51. An improvement in the method for performing NMR
 2 imaging of Claim 44 wherein the metal ion is
 3 manganese(II) and the compound is
 4 N,N'-bis-(pyridoxal-5-phosphate)ethylenediamine5 N,N'-diacetic acid, N,N'-bis-(pyridoxl)5-phosphate)-trans-1,2-cyclohexyldiamine-N,N'-diaceti
 7 c acid, or a salt thereof.
- 1 52. An improvement in the method for performing NMR
 2 imaging of Claim 51 wherein the salt is a calcium
 3 salt with a molar ratio of calcium to chelating
 4 compound of from 0.05 to 1.0.
- 1 53. An improvement in the method of performing NMR
 2 imaging of Claim 44 wherein from 0.001 to 5 mmole of
 3 chelate is administered per kg of patient body
 4 weight.
- 1 54. An improvement in the method of performing NMR
 2 imaging of Claim 53 wherein from 0.02 to 0.5 mmole
 3 of chelate is administered per kg of patient body
 4 weight.

-57-

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